RIMA OIL PRODUCED WATER TREATMENT PLANT

Project Overview
The SusTeco RWTP (Rima Water Treatment Plant) project introduces an innovative, nature-based solution for treating and disposing of Oil Produced Water (OPW). Unlike conventional deep-well disposal (DWD) methods—which consume large amounts of fossil energy and chemicals—this project uses a biological treatment process. By harnessing natural processes in wetlands and evaporation zones, the plant not only purifies wastewater but also creates a wildlife oasis in the desert. The project is structured as a DBOOM (Design, Build, Own, Operate, Manage) initiative, combining a two-year design and construction phase with 20 years of operation.

Key Components and Design

- **Site and Infrastructure:**
  - The plant is spread over an area of approximately 25.5 km² in Oman's central desert.
  - It integrates several key plant parts including:
    - **Stilling Basin (SB):** A large HDPE-lined pond for initial water storage and oil skimming.
    - **Stripping Area (SA):** For H_2S stripping and aeration to lower water temperature.
    - **Overflown Wetland (OW):** A shallow pond system (ca. 130 ha) lined with a natural Mineral Sealing Layer (MSL) that enhances purification.
    - **Area for Evaporation (AE):** An embankment dam spanning up to 300 ha to facilitate the evaporation of treated water.
- **Process Flow:**
  - OPW is metered at the plant's entry, flows through a 1.3 km pipeline, and enters the SB where gravity-driven purification begins.
  - Oil is skimmed and stored before the wastewater moves through the natural treatment sequence, ensuring a biodegradation of over 99% of the oil content.

Performance and Achievements
Since its operation beginning in July 2022, the plant has delivered impressive performance metrics:

- **Environmental Impact:**
  - **Electricity Savings:** Approximately 276 MWh per day, adding up to 2,004 GWh over 20 years.
  - **Natural Gas Conservation:** Saves around 65,136 m³ of fuel gas per day (nearly 473 million m³ in 20 years) by reducing the need for power-intensive pumping.
  - **CO_2 Emissions Reduction:** Avoids the emission of roughly 139 tonnes of CO_2 daily, totaling over 1 million tonnes in 20 years.
- **Operational Excellence:**
  - The plant recorded zero lost time incidents (LTIs) during its construction phase.
  - It has successfully treated over 30,000,000 m³ of OPW, returning recovered oil to PDO and significantly reducing the environmental footprint.

Environmental and Economic Benefits
The RWTP's nature-based approach creates a dual advantage:

- **Cost Efficiency & Revenue Generation:**
  - By replacing conventional DWD methods, the plant significantly reduces operational costs.
  - The savings in fuel gas not only lower disposal costs but also open up additional revenue streams through the sale of the conserved fuel.

- **Sustainable Construction & Ecosystem Enhancement:**
    - The in-situ preparation of the Mineral Sealing Layer (MSL) using locally available soil minimizes rock cutting and material transport.
    - The expansive evaporation and wetland areas contribute to local biodiversity by providing habitats for birds, insects, and fish while positively influencing the microclimate.

Triple-D Benefits (Decarbonisation, Detoxification, De-materialisation)
The project stands out with its Triple-D benefits:

- **Decarbonisation:** By substituting energy-intensive conventional methods with a natural process, the plant drastically cuts CO_2 emissions and supports biological carbon sequestration.
- **Detoxification:** The reliance on microbial degradation over chemical additives (like demulsifiers and flocculants) minimizes the release of harmful substances into the environment.
- **De-materialisation:** Utilizing natural earthen basins and local materials eliminates the environmental costs of sourcing and processing synthetic construction materials.

Conclusion
The SusTeco RWTP project is a pioneering example of sustainable industrial water management. It redefines OPW treatment by leveraging nature's processes, thereby delivering substantial environmental, economic, and social benefits. The plant not only reduces energy and resource consumption but also paves the way for future renewable, scientific, and agricultural developments in the region.

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